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therefore lowers the power and increases the ability to achieve higher refresh rates for a video display application.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrated and not restrictive. The scope of the invention is, therefore, indicated by the appended claims and their combination in whole or in part rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed and desired to be secured by United States Letters Patent is:

1 1. A field emission device comprising an emitter tip formed from and integral
2 with an emitter layer, the emitter tip having a height and including a base and an apex,
3 wherein said emitter tip has a substantially rectilinear profile between said base and said
4 apex, said substantially rectilinear profile being defined by a tip arc length and a tip chord
5 length, wherein the ratio of said arc length to said chord length is less than or equal to about
6 1.2:1.

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8 2. A field emission device according to claim 1, wherein the ratio of said tip arc
9 length to said tip chord length is less than or equal to about 1.1:1.

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11 3. A field emission device according to claim 1, wherein the ratio of said tip arc
12 length to said tip chord length is less than or equal to about 1.05:1.

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14 4. A field emission device according to claim 1, wherein the ratio of said tip arc
15 length to said tip chord length is less than or equal to about 1.01:1.

1 5. A field emission device comprising:

2 an emitter layer including an emitter tip that has a height and including a base
3 and an apex, wherein said emitter tip has a rectilinear profile between said base and
4 said apex that is defined by a tip arc length and a tip chord length, wherein the ratio
5 of said arc length to said chord length is less than or equal to about 1.2:1;

6 a substrate; and

7 a cathode conductive layer disposed over said substrate, said emitter tip being
8 disposed over said cathode conductive layer.

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10 6. A field emission device according to Claim 5, further comprising:

11 a conductive gate structure disposed over said cathode conductive layer;

12 an aperture through said conductive gate structure, said emitter tip being
13 exposed within said aperture; and

14 an anode panel positioned over said conductive gate structure and said emitter
15 tip.

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17 7. A field emission device according to Claim 6, wherein said anode plane
18 comprises:

19 an anode conductive layer;

20 a phospholuminescent panel for emitting light upon being excited by
21 electrons; and

22 a transparent panel.
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1 8. A flat panel display device comprising:
2 a substrate;
3 a cathode conductive layer disposed over said substrate;
4 an array of emitter tips each formed from an emitter layer disposed over said
5 substrate, each of said emitter tips having a height and including a base and an apex,
6 each of said emitter tips having a substantially rectilinear profile between said base
7 and said apex that is defined by a tip arc length and a tip chord length, wherein the
8 ratio of said arc length to said chord length is less than or equal to about 1.2:1;
9 a conductive gate structure disposed over said cathode conductive layer;
10 an array of apertures formed through said conductive gate structure, each of
11 said emitter tips being exposed through one of said apertures; and
12 an anode panel for emitting light in response to electrons emitted from said
13 array of emitter tips.
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- 1 9. A field emission device comprising:
- 2 a substrate;
- 3 a cathode conductive layer disposed over said substrate; and
- 4 an emitter tip integral with an emitter layer disposed over said cathode
- 5 conductive layer and having a base, an apex, and a continuously concave exterior
- 6 surface extending from the base to the apex.
- 7
- 8 10. A field emission device according to Claim 9, further comprising:
- 9 a conductive gate structure disposed over said cathode conductive layer;
- 10 an aperture through said conductive gate structure, said emitter tip being
- 11 exposed within said aperture; and
- 12 an anode panel positioned over said conductive gate structure and said emitter
- 13 tip.
- 14
- 15 11. A field emission device according to Claim 10, wherein said anode panel
- 16 comprises:
- 17 an anode conductive layer;
- 18 a phospholuminescent panel for emitting light upon being excited by
- 19 electrons; and
- 20 a transparent panel.
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12. A field emission device comprising:
- a substrate;
- a cathode conductive layer disposed over said substrate; and
- an emitter tip projecting from and integral with an emitter layer disposed over said cathode conductive layer and having a base, an apex, and an exterior surface, said exterior surface having a substantially paraboloid vertical profile that extends from the base to the apex.
13. A field emission device according to Claim 12, further comprising:
- a conductive gate structure disposed over said cathode conductive layer;
- an aperture through said conductive gate structure, said emitter tip being exposed within said aperture; and
- an anode panel positioned over said conductive gate structure and said emitter tip.
14. A field emission device according to Claim 13, wherein said anode panel comprises:
- an anode conductive layer;
- a phospholuminescent panel for emitting light upon being excited by electrons; and
- a transparent panel.

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15. A field emission device comprising:
a substrate;
a cathode conductive layer disposed over said substrate; and
an emitter tip that is an integral portion of a single emitter layer disposed over said cathode conductive layer and having a base, an apex, and an exterior surface, said exterior surface having an ovoid profile that extends from the base to the apex.
16. A field emission device according to Claim 15, further comprising:
a conductive gate structure disposed over said cathode conductive layer;
an aperture through said conductive gate structure, said emitter tip being exposed within said aperture; and
an anode panel positioned over said conductive gate structure and said emitter tip.
17. A field emission device according to Claim 16, wherein said anode panel comprises:
an anode conductive layer;
a phospholuminescent panel for emitting light upon being excited by electrons; and
a transparent panel.

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18. A field emission device comprising an emitter tip formed from an emitter layer, the emitter tip having a height and including a base and an apex, wherein said emitter tip is generally conical and has a substantially rectilinear profile between said base and said apex.

19. A field emission device according to Claim 18, wherein said substantially rectilinear profile is defined by a tip arc length and a tip chord length, wherein the ratio of said arc length to said chord length is less than or equal to about 1.2:1.

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20. A flat panel display device comprising:

a substrate;

a cathode conductive layer disposed over said substrate;

an array of emitter tips formed as a part of an emitter layer disposed over said substrate, each of said emitter tips having a height and including a base and an apex, each of said emitter tips having an exterior surface, said exterior surface having a profile with a continuous shape that extends from the base to the apex, said continuous shape being selected from the group consisting of a concave shape, a substantially paraboloid shape, and an ovoid shape;

a conductive gate structure disposed over said cathode conductive layer;

an array of apertures formed through said conductive gate structure, each of said emitter tips being exposed through one of said apertures; and

an anode panel for emitting light in response to electrons emitted from said array of emitter tips.